

Remarks

Claims 13 and 18 have been cancelled; and claims 1, 2, 4-6, 8, 10-12, 14-16, and 19 have been amended. New claim 20 has been added, and claims 1-12, 14-17, 19 and 20 remain in the application. Reexamination of the application as amended is respectfully requested.

Amended claim 1 requires "orienting the jetting valve to provide a jetting direction nonperpendicular to the surface of the substrate." As also recited in claim 1, the advantage of such an orientation is that "a wetted area on the substrate produced by the droplet is less than a wetted area on the substrate resulting from a jetting direction being perpendicular to the surface of the substrate." As described in Paragraph 41 of the application, jetting the viscous material at an angle to the substrate first, increases the accuracy and repeatability with which the viscous material can be applied into a corner area between a substrate surface and a chip sidewall. Further, with the impact forces of the droplets directed into a corner adjacent the gap, the wetted area of the viscous material on the substrate is reduced. A smaller wetted area provides a potential for increased device density on the substrate and thus, making the substrate smaller. In addition, increasing the speed at which the dispenser is moved by the positioner often results in an increase in the wetted area. By jetting at an angle, the positioner speed can be increased without increasing the size of the wetted area when compared to nonangular jetting. Therefore, potentially the cycle time for an underfill process can be shortened, thereby reducing costs. Further, the greater viscous material deposition accuracy and repeatability also often means that less viscous material will be used, which also translates into a savings in cost.

Claim 1 is rejected under 35 U.S.C. §103(a) as being unpatentable over Mathias et al. (U.S. Pat. No. 5,565,241) in view of Messerly et al. (U.S. Patent No. 6,253,957). Mathias et al. relates to a spray coating apparatus having a spray nozzle 1 of Fig. 2 with a plurality of atomizing holes 6. Messerly et al. relates to a method and apparatus for dispensing small amounts of liquid material. Messerly et al. clearly shows a dispensing direction

perpendicular to the substrate. Mathias et al. does not show a substrate and no orientation of the spray cone with respect to a substrate is taught.

Applicants submit that a prima facie case of obviousness is not made because the cited references in combination do not teach, suggest or motivate one to provide a method of noncontact dispensing a viscous material onto a surface of a substrate as recited in claim 1. In contrast to Mathias et al. and Messerly et al., the invention of claim 1 requires "orienting the jetting valve to provide a jetting direction nonperpendicular to the surface of the substrate." As also recited in claim 1, the advantage of such an orientation is that "a wetted area on the substrate produced by the droplet is less than a wetted area on the substrate resulting from a jetting direction being perpendicular to the surface of the substrate."

The combination of Mathias et al. and Messerly et al. does not teach or suggest that a reduction in a wetted area when dispensing a viscous material can be achieved by orienting the valve nonperpendicular to the substrate. Messerly et al. teaches a perpendicular orientation; and neither reference discusses or suggests the importance of controlling a wetted area on the substrate. Therefore, Applicants submit that Claim 1 is patentable and not obvious under 35 U.S.C. §103(a) over Mathias et al. in view of Messerly et al.

Claims 1-19 are rejected under 35 U.S.C. §103(a) as being unpatentable over Hynes et al. (U.S. Pat. No. 6,447,847) in view of Hogan et al. (U.S. Pat. No. 5,294,459) and further in view of Messerly et al. as applied to claim 1. Hynes et al. relates to a system having a multi-axes positioning system that supports and moves multiple conformal coating applicators that may be moved to tilted orientations with respect to a substrate. The conformal coating is dispensed using a dispensing valve or a spray valve. Spray valve 32 is a pneumatically actuated valve that combines conformal coating with pressurized air to dispense an atomized spray pattern, such as, for example, a round spray pattern. Dispensing valve 34, also referred to as a "needle valve," is also a pneumatically actuated

valve, but flows conformal coating through an interchangeable needle orifice, col. 2, lines 56-63.

Hogan et al. relates to a coating system for applying a viscous coating to printed circuit boards using either an atomized or nonatomized spray. Messerly et al. relates to a method and apparatus for dispensing small amounts of liquid material.

The combination of Hynes et al., Hogan et al and Messerly et al. does not teach or suggest that a reduction in a wetted area can be achieved by orienting the valve nonperpendicular to the substrate. Hynes et al. has a spray valve and a dispensing valve for flowing conformal coating material onto a substrate. Hogan et al. utilizes an atomized or nonatomized spray. Messerly et al. teaches a perpendicular orientation and does not discuss wetted areas. The references do not teach or discuss the importance of controlling a wetted area on the substrate. Therefore, Applicants submit that Claim 1 is patentable and not obvious under 35 U.S.C. §103(a) over Hynes et al. in view of Hogan et al. and further in view of Messerly et al.

Applicants submit that the application is now in condition for allowance. The Examiner is invited to contact the undersigned in order to resolve any outstanding issues and expedite the allowance of this application.

Applicant does not believe that any fees are due in connection with this submission. However, if such petition is due or any fees are necessary, the commissioner may consider this to be a request for such and charge any necessary fees to Deposit Account No. 23-3000.

Respectfully submitted,

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